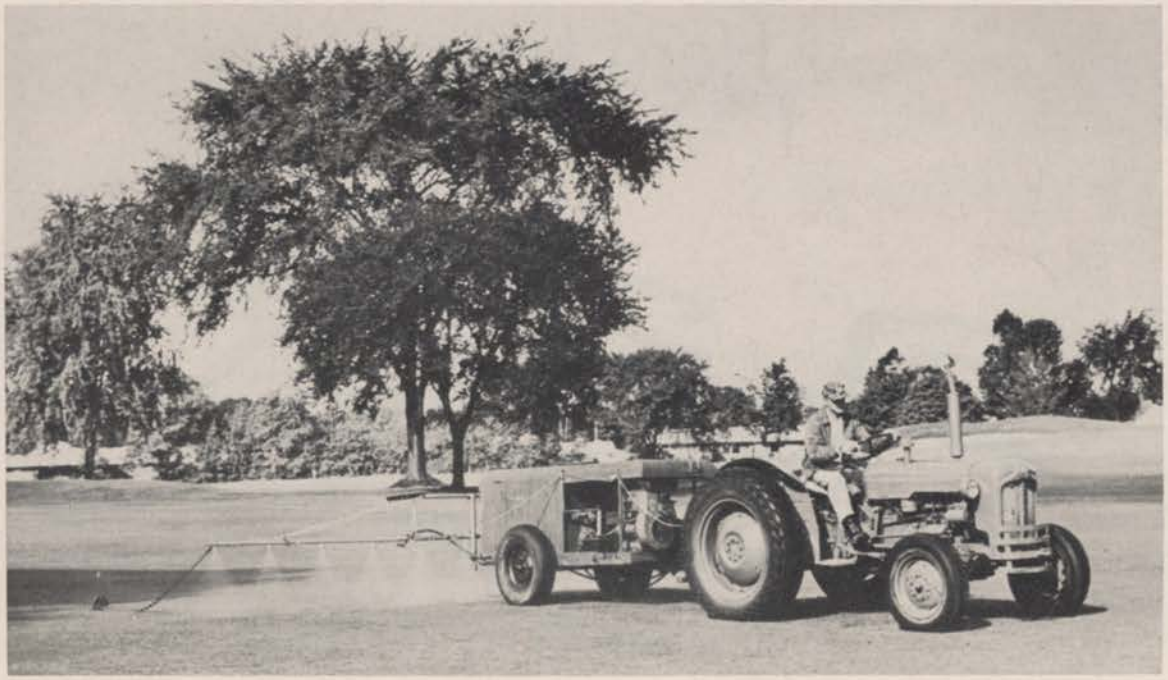
WEEDS and TURF PEST CONTROL

APRIL 1963

Monthly news for contract sprayers of weeds, turf, ornamentals, and trees



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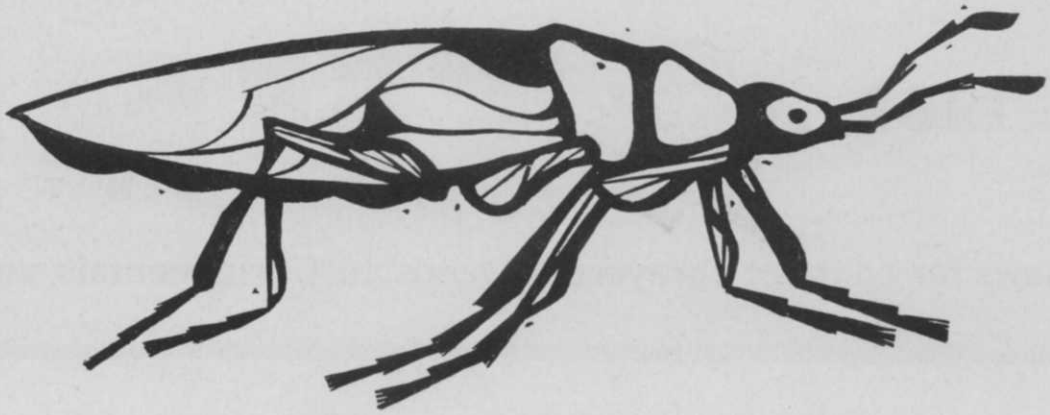

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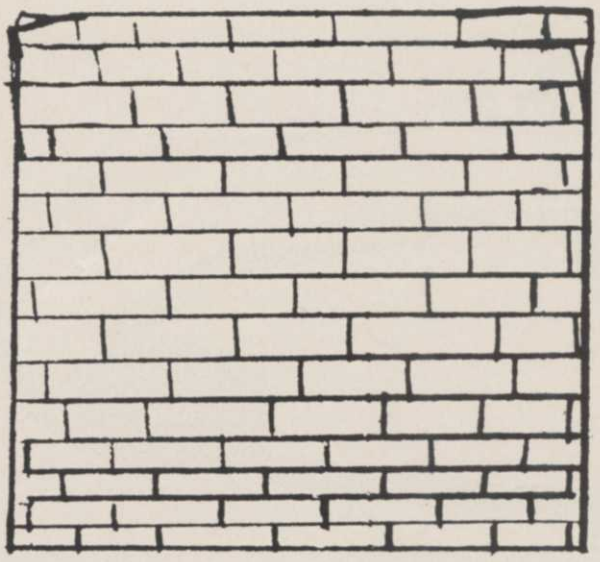

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WEEDS and TURF
PEST CONTROL
A SECTION OF PEST CONTROL MAGAZINE

April, 1963

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Ambassadors all!

Contract application of weed and turf chemicals is a relatively young industry, and because of this youth, CAs need to speak out positively and proudly to the public.

Potential customers and possible suppliers alike may not know enough about the size and scope of the custom spraying business. Who is qualified to spread this message more than industrymen themselves?

Ambassadors all, CAs should watch for every chance to tell this dramatic story:

How many people know, for example, that in Florida alone, horticultural spraymen gross $25 million a year — and that in New York state there are 325,000 *acres* of lawns and turfgrass! Percentage of turf work done by contract is ever increasing, and many operators who start out just to curb pests end up fertilizing and verticutting lawns as well.

Or how many of your customers know that in industrial weed control, a primary function of contract applicators, single jobs may reach $250,000 or more? And this casts no disfavor on the thousands of smaller jobs CAs do every day, with staggering total dollar volume.

In aquatic weed control, which according to *Chemical Week* (July 7, 1962) accounts for five to ten million dollars a year in retail herbicide sales, CAs also excel. According to *CW*, "Top buyers of aquatic compounds are probably the professional applicators."

This is a profession to be proud of, one to talk up at every opportunity. Tell your story at service clubs, at garden club lunches, wherever you have a chance to speak.

Every CA is a goodwill ambassador who can help himself and his fellow spraymen by letting Americans know how important the contract applicator is to the nation's economy.

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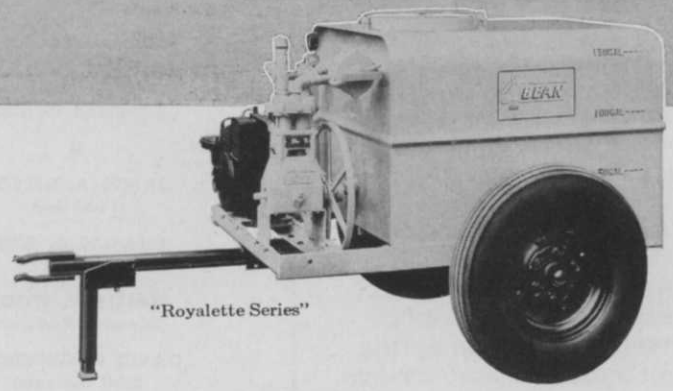

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A Basic Guide to Turfgrass Fertilization

By Dr. D. P. SATCHELL
Manager, Agronomic Service Division
The American Agricultural Chemical Company
New York, New York

EACH year thousands of acres of land are converted into grass culture—grass for beauty, grass for erosion control, grass for recreation, grass for a thousand-and-one reasons.

No other plant is so intimately associated with people.

The large-seeded grasses such as wheat, corn, oats, barley, and rye contribute a large part of our diet—both solid and liquid. Also many of the same small-seeded species used for turf provide the basis for animal products. However, the fastest growing use of grass is in production of special-purpose turf.

Amazing national statistics can be quoted on the number of acres, the amount of labor, the tons of chemicals, the seed, etc., devoted to special-purpose turf culture. These are useful only if they prod the contract applicator into looking at what is happening in his area of operations.

Applications of fertilizer, insecticides, fungicides, herbicides, seed, growth-controlling chemicals, soil-stabilizing emulsions and materials, etc., necessary for the establishment and maintenance of special-purpose turf, would seem to provide the nearly year-round work needed to efficiently utilize machine and man power. CAs could not make a realistic *special-purpose turf* survey in their areas without getting excited about the potential!

Before spraymen get too excited they should remember that satisfaction and success is strictly dependent on, at least, minimum know-how. If you think a dead tree or two is trouble, try burning a football field a few days before homecoming or the golf greens on a famous course just before a big tournament! Fortunately, few operators will need to know the peculiarities of all or even most turfgrasses. While excellent books and bulletins are available on grass, such information must be tempered with keen observation of local conditions. Altitude, exposure, shading, drainage are some of the factors which markedly alter grass responses within small areas — even within a single yard.

We fertilize turf to improve its qualities of color, density, texture, and uniformity. Persistence, rooting depth, resistance to environmental hazards, salt, traffic, frost, insects, and disease are less obvious factors of quality that can be important. We cannot change the characteristics of grasses by fertilization, but we can greatly enhance color, density, uniformity, and resistance to some hazards by proper fertilization.

What is Fertilizer?

Fertilization is the addition of elements necessary for plant growth that are not naturally present in sufficient quantity or available form to support the desired rate of growth. Growing plants are mostly carbon (C), hydrogen (H), and oxygen (O) supplied from the air as carbon dioxide and from water. The other essential 13 elements needed by plants are the ones we fertilize to supply. Grass fortunately does not have a high requirement for any of the elements which are needed in very small quantities. For all practical purposes we can eliminate boron (B), chlorine (Cl), copper (Cu), molybdenum (Mo), and zinc (Zn) from our fertilizer element list. However, iron (Fe) and manganese (Mn), and particularly iron, can be troublesome. Soil normally contains plenty of these elements, but the wrong conditions will make them unavailable to plants. This situation is frequently caused by naturally alkaline soils or by overliming. Since liming is a form of fertilization, we can appropriately clear this up at this point.

Acid and Alkali Soils

The particles that make up the soil started out "neutral," just like common salt is neutral — composed of two dangerous elements, sodium (Na) and chlorine (Cl). When dissolved in water, compounds such as salt break up (ionize) to form positively and negatively charged particles called "ions." Positively charged ions are called "cations" or commonly "bases" and the negatively charged ions are called "anions."

The common bases in soils are calcium (Ca^{++}), magnesium (Mg^{++}), potassium (K^{+}), sodium (Na^{+}), and ammonium (NH_4^{+}). The common anions are nitrate (NO_3^{-}), phosphate ($H_2PO_4^{-}$) (HPO_4^{-}), chlorine (Cl), bicarbonate (HCO_3^{-}), carbonate (CO_3^{-}), and sulphates (HSO_4^{-}) (SO_4^{-}). When rain falls on the soil, carbon dioxide in the soil air is dissolved to form carbonic acid. This acid combines with bases and the resultant salt solution is carried away in the drainage water. This process of leaching continually depletes soils of their bases and makes them more acid. This happens in areas where rainfall is high enough to carry salts out in the ground water. In our drier western states, dissolved salts are carried toward the surface as the water evaporates. Salt slicks and alkali soils are formed in this way.

When bases are leached from soil particles, the particles become negatively charged. This charge is satisfied by hydrogen ions (H^{+}). The soil particles are large complex anions which are weak acids when their charges are satisfied with hydrogen and complex salts when satisfied with bases. Not all soil particles are charged. Sand is frequently quartz and is not charged. Clay and humus are highly charged. Since soil particles are relatively large, they do not move, but the hydrogen and bases on

Contract turf fertilization, from lawn to industrial park, is big business in America. This article by turfgrass fertilizer expert Satchell shows CAs what processes are involved, and how to complete a job successfully.

their surfaces do dissolve (ionize) to some extent. If another base or hydrogen is dissolved in the soil water, the added base or hydrogen will slip in and satisfy the charge on the particle leaving the original base or hydrogen free to move out in the drainage water. This process is called "base exchange" or more properly "cation exchange" since hydrogen (not a base) plays such an active role.

Granular or liquid fertilizers may be used for lawn fertilization. This typical operator, who has a completely outfitted rig, combines insect control, weed control, and fertilization to offer customers an attractive, all around lawn service.

pH and Acidity

One can measure the proportion of bases on soils indirectly by measuring the amount of hydrogen in the soil water. This is done easily and is the familiar pH determination — one of the most important tests available to turfmen. If the soil water contains more hydrogen than pure water, pH values less than 7 will be obtained and we call these soils acid or sour. Conversely, if less hydrogen is present, pH values greater than 7 will be obtained and the soils are called alkaline or sweet.

The optimum pH values for most grasses is between 6 and 7. Kentucky bluegrass, Bermudas, zoysia, and fescues do best near neutral to slightly acid (6.5 - 7) pH values. Bents and carpetgrass tolerate more acidity. Centipede grass is unusual and frequently shows iron deficiency at pH values much greater than 6.

Lime is used to raise the pH value of acid soils to a desirable range. About 100 lbs. of ground limestone per 1,000 square feet of area will raise the pH about 1 unit. Of course, clays and organic soils require more because of their higher exchange capacity and sands will require less. Sometimes we need to lower the pH values for plants that have high iron requirements, such as azaleas, laurel, rhododendron, blueberries, and andromeda. Sulfur or aluminum sulfate will do this. Twenty-five pounds of sulfur or 60 lbs. of aluminum sulfate per 1,000 square feet of area will lower the pH about one unit.

Secondary Nutrient Elements

Lime supplies essential calcium (Ca) and magnesium (Mg). Calcium (Ca), magnesium (Mg), sulfur (S), and iron (Fe) are required by plants in relatively large amounts. If proper pH values are maintained by limestone, there is little need to worry about calcium. Magnesium can also be taken care of by the use of dolomitic (high magnesium) limestone. Magnesium deficiencies are not likely to occur except on acid sandy soils. Sulfur is adequately supplied by most complete fertilizers. Superphosphate (20%) is about one-half gypsum (calcium sulfate) and thus contains about 12% sulfur. High-analysis, lightweight fertilizers are relatively low in both calcium and sulfur since there is no "room" in the formula to include superphosphate. Sulfur deficiencies occur in areas with little industry and few people because considerable sulfur is released into the atmosphere by combustion of coal and by burning waste materials.

Iron deficiences are seen fairly often on turfgrass. Few, if any, soils are actually deficient in iron for grass culture. When iron deficiency is suspected, test soil pH values. If the values are on the high side, frequently the use of an acid-forming nitrogen fertilizer will be all that's needed.

Primary Nutrient Elements

The main reason for fertilization is to supply nitrogen (N), phosphorus (P), and potassium (K). The familiar grades such as 10-6-4 give the percent *by weight* of these nutrients. The actual pounds of nutrients is found by multiplying the total weight by the grade figures, for example: a 50 lb. bag of 10-6-4 fertilizer contains 5 lbs. of nitrogen (N), 3 lbs. of available phosphate (P_2O_5), and 2 lbs. of water-soluble potash (K_2O). For historical reasons, phosphates and potash are expressed as the oxides. Guarantees on the elemental basis are being sponsored by scientific groups. To determine elemental contents multiply P_2O_5 by 0.436 and K_2O by 0.83. In the example; 3.0 x 0.436 = 1.31 lbs. of P, and 2.0 x 0.83 = 1.66 lbs. of K.

High-Analysis Fertilizers

The availability of more concentrated raw materials have permitted higher analysis fertilizers. Labor savings in handling and application and in cost of transportation and storage are the main attributes of these fertilizers. In addition to the gypsum, calcium and trace elements are largely eliminated in the very high-analysis fertilizers. More attention to liming will be needed with their use.

Grass responds tremendously to nitrogen. The normal farm fertilizer induces very rapid growth that is fairly short lived. The sources of nitrogen used include ammonium nitrate (33.5% N), urea (45% N), ammonium sulfate (20.5% N), ammonium phosphates (11 to 21% N) and sodium nitrate (16% N). Nitrogen from these sources is soluble and readily available to plants. If the plants' season's requirements were to be put on at one time, the grass would first be "burned," then very rapid growth would result and finally at the end of the season, growth would be very slow. Ideally these materials would be applied at monthly intervals or less to give the steady growth desired. The alternative solution would be to use materials that became available more slowly so that 1 or 2 applications are needed, and that are not soluble enough so that the grass is "burned" on application. Natural organics (such as Agrinite) do this job very well. Their main drawback is that they are low analysis and

expensive to manufacture and ship. Synthetic organics are higher analysis and are increasing in use rapidly. If a synthetic organic nitrogen source is properly balanced with a quickly available nitrogen and these are combined with phosphate and potash into compact granules, we have practically eliminated the problem of "burn" and the necessity for more than 2 or 3 applications for top quality general purpose turf. Both natural and synthetic organic nitrogen sources depend on soil bacteria and fungi to break down the material to make it available to plants. The first year synthetic organics are used, particularly in the South, growth response has been reported as less than expected. It might well be that a year is needed to build up the population of micro-organisms that make this material available.

The growth response to nitrogen is so great that it overshadows response to phosphorus and potassium. Applications of nitrogen is like accelerating a car — you don't go any farther on a tankful of gas, just faster. Almost all soils are naturally deficient in phosphorus and will require liberal phosphate additions at time of grass establishment. With continued liberal fertilization, phosphorus tends to accumulate because it does not leach out of the soil. When grass is being established, a fertilizer high in phosphate is used, such as 6-10-4. Once established, a grade like 10-6-4 is good. For irrigated areas, especially when the clippings are removed and a high level of maintenance is practiced, a grade high in nitrogen and potash is required, such as 12-4-8.

When to Fertilize Turf

Grass should be fertilized just ahead of its natural growing season. In general there are two groups of grasses; cool-season grasses, and warm-season grasses. Cool-season grasses include bluegrass, fescues, bents, ryegrass, and red top. These grasses will grow in very cold soil; in fact, whenever the soil is not frozen. They do not stand prolonged high temperatures and will usually not survive in southern areas except at higher altitudes and in the shade.

From a custom applicator's standpoint there is a decided advantage in the growth habits of cool-season grasses since fertilizer can be applied any time in late winter or early spring. These grasses should not be fertilized heavily during the hot months. If they are overstimulated, food reserves are taken from the roots and they are easy prey to disease and extended droughts. The best time to fertilize cool-season grasses heavily is during the fall. There is proportionally greater root growth compared to top growth during this period than during the spring flush of growth (in the spring the grass is trying to form seed heads). In the fall there is less danger of overstimulation resulting in an outbreak of disease, and the trees do not compete as strongly for water and light. In the mowing management of cool season grasses, it is important to use a high cut (2″-3″) during the summer months.

Warm-season grasses (Bermuda, zoysias, bahia, centipede, carpet, St. Augustine) grow little when air temperature is less than 60° F. and soil temperature is less than 50° F. These grasses should be fertilized when the above conditions are first reached in the spring, and depending on the growth desired, periodically until cool weather comes in the fall.

How Much to Use?

The amount of fertilizer to use depends on a lot of factors and it is impossible to prescribe for all possible conditions. Managers of airports and highway engineers are going to want the minimum growth necessary to control erosion and dust, while a golf course superintendent must keep the greens growing all season. The golf course superintendent will use 10 to 20 times the fertilizer per unit area as the highway engineer and both may be using the right amount.

The most attractive grasses have relatively high fertilizer requirements and will not present a superior appearance unless these requirements are met. Bents, Merion bluegrass, and improved Bermuda varieties should be fed quite heavily. Kentucky bluegrass, red fescues, St. Augustine, zoysia, and common Bermuda are moderate in their fertility requirements. Bahia, centipede, carpet, ryegrass, and tall fescues are useful for low maintenance areas.

In general, southern areas will require more fertilizer than northern areas, particularly on sandy soils where leaching losses are high. Irrigated grass requires more fertilizer than nonirrigated, and grass grown under trees or around ornamentals will require higher amounts. Cool-season grass grown for ordinary lawn purposes in the moderate group should receive 2 to 3 lbs. of nitrogen. Ten lbs. of a 10-6-4 grade in early spring and 10 to 20 lbs. in the early fall will meet these requirements. If only one application is to be made it should be made in the fall. A comparable application rate for southern grasses would be 3-4 lbs. of nitrogen. Applied, for example, at 10 lbs. of a 10-6-4 per 1,000 sq. ft. in early spring, June, July and September.

Fertilizer comes in many physical forms — granules, dusts, slurries, and liquids. Each form has its advantages and disadvantages. Most applicators have found the fine granule to be the most acceptable and easiest to use with the widest range of equipment. Uniformity of application is a must as overlaps and skips ruin the appearance of grass areas. Applicators with spinning fans do a good job around obstructions and feathering of one application strip into the next without streaking.

Meeting Dates

International Shade Tree Conference, Western Chapter, Annual Convention, Star Dust Hotel, Las Vegas, Nev., May 12-15.

Chemical Specialties Manufacturers Assn. Mid-Year Meeting, Drake Hotel, Chicago, Ill., May 20-22.

National Plant Food Institute Annual Conference, Greenbrier Hotel, White Sulphur Springs, W. Va., June 9-12.

3rd Annual Meeting, Fla. Society of Golf Course Superintendents, Jacksonville, June 18-20.

American Society of Landscape Architects Annual Meeting, Penn-Sheraton Hotel, Pittsburgh, Pa., June 23-26.

American Assn. of Nurserymen Annual Convention, Shamrock Hilton Hotel, Texas, July 20-24.

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Success in turf care requires good insect control. You get powerful, long-lasting results against chinch bugs and sod webworms by using SEVIN insecticide, even when these pests are resistant to other insecticides. And SEVIN is safer than many insecticides—safer to applicators, to persons and pets in the area, and to birds, fish and other wildlife. Just follow label directions carefully.

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UNION CARBIDE AGRICULTURAL CHEMICALS

Panogen Turf Fungicide:

Morton's New Chemical for Lawn Spraymen

By DR. MARGARETA LAMBERT
Supervisor of Technical Service
Research Department, Morton Chemical Company, Woodstock, Illinois

Dr. Lambert

MOST contract applicators have customers who, at one time or another, have worried over brown or thin spots in turf areas where grass is wilting or dying.

Chances are this is a result of turf diseases. If so, one cure is near at hand, because treatment with Panogen Turf Fungicide will control the spread of already established diseases. Preventive treatment in a regularly scheduled spraying program will keep the turf healthy and vigorous.

Panogen Turf Fungicide is a red liquid which mixes completely with water to form a clear solution. It affords ease of application, is effective for control of common turf diseases, and is economical to use.

Active Ingredient

This new fungicide contains methylmercury dicyandiamide. This organic mercury compound has proven itself in the past as an effective broad spectrum fungicide which controls most of the fungi causing foliage diseases or seedling diseases, such as damping-off. Methylmercury dicyandiamide is an ingredient in Panogen seed treatment fungicide, which is commonly used for treatment of seeds such as small grain, cotton, beans, and peas to help control seed rot, smut, seedling blight, and other diseases.

It is also an ingredient in Morton Soil Drench, a product sold to treat soil for control of various soil-inhabiting fungi. It has been used successfully as a spray on numerous types of flowers and ornamentals.

In addition to being an excellent fungicide, methylmercury dicyandiamide is safe when applied to growing plants. At the low concentrations needed for fungus control, there is no danger of injury to these plants. Methylmercury dicyandiamide is a broad spectrum fungicide which has proven effective for control of most common disease-causing fungi. This is particularly important in the case of turf diseases, where diagnosis of the actual causative fungus may be difficult. Panogen Turf Fungicide is effective against all of the common turf diseases.

Formulation

PTF is a liquid, generally sold in glass bottles, but also available in 5-gallon cans. The liquid is completely clear, but contains a red dye for identification purposes. Freezing point of the liquid is –16° F, and consequently the compound can be stored at low temperatures without danger of crystallization. Should the liquid freeze it will readily thaw out when brought to higher temperatures. No decomposition takes place at freezing temperatures.

Color

Panogen Turf Fungicide contains a powerful red dye, and when diluted with water, the mixture maintains a faint pink color which readily identifies it. There is not enough red dye in this mixture to cause any problems with discoloration of objects which may accidentally be sprayed. People walking on newly treated turf will not pick up any of the red color on their shoes.

Compatibility

In many cases, it might be desirable to apply this fungicide in conjunction with other materials needed for treatment of the turf. It may, for example, be desirable to make fertilizer applications to turf areas. Testing has shown that PTF is compatible with common constituents of liquid fertilizers, such as potassium salts, phosphates, urea, ammonium salts, nitrates. Panogen Turf Fungicide can consequently be mixed with these materials at the time of application.

Sometimes it may be desirable to apply an insecticide for control of chinch bugs, crickets, mosquitoes, chiggers, etc. Tests have shown this chemical is stable in tank mixtures with several different insecticides, such as DDT, aldrin, dieldrin, heptachlor, Trithion.

Iron chlorosis is sometimes a problem on turf. If it is desirable to apply iron salts for control of iron deficiency, these materials can be mixed with PTF in the tank.

When mixing this fungicide with materials such as liquid fertilizers or insecticides, it is advisable to make up the tank mixture just prior to use. It should not be stored for any period of time before use. It must be remembered that not all known formulations of the materials mentioned above have been tested.

Stability

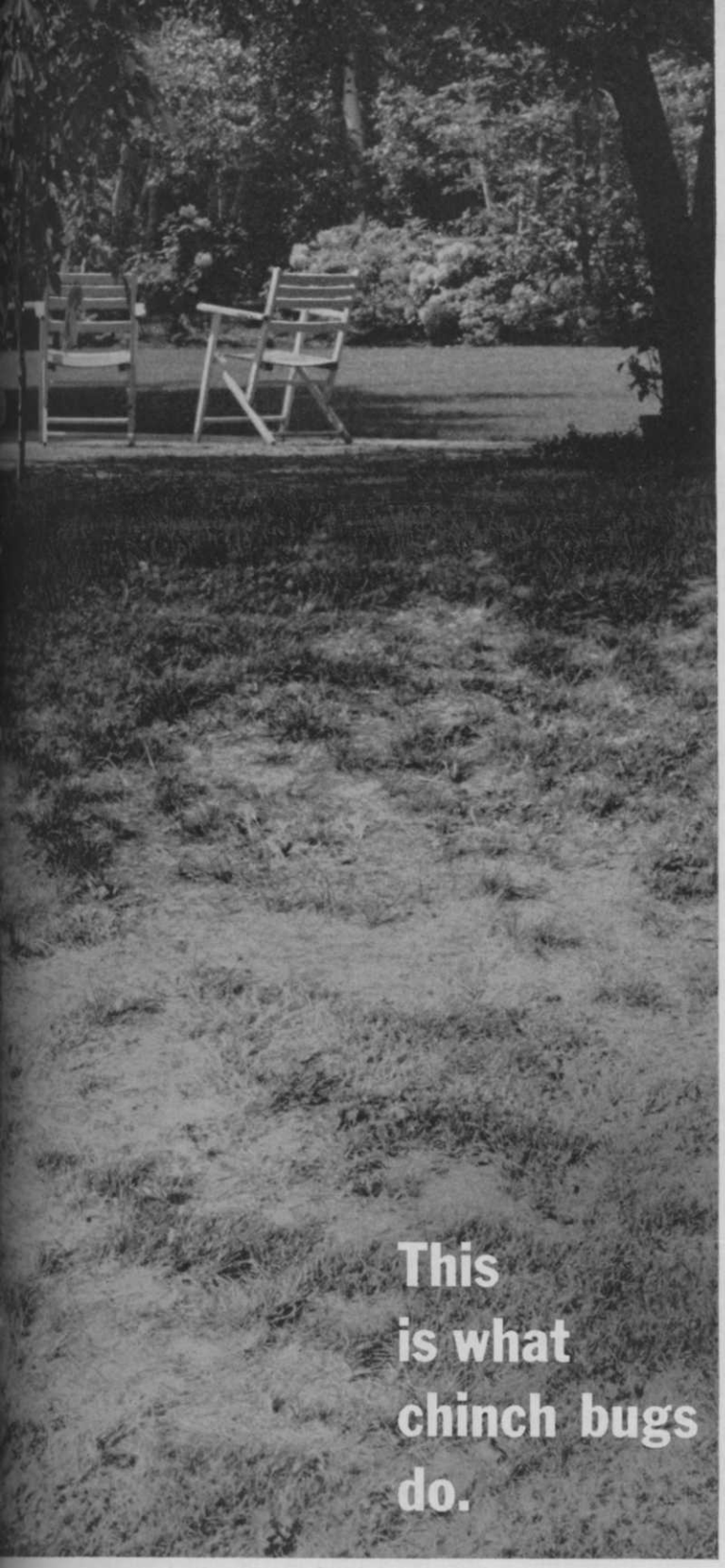
Panogen Turf Fungicide does not deteriorate during storage. Even after many years it will maintain its clear appearance and no decomposition will take place either at high or low temperatures.

Results of Tests

This product has been thoroughly tested by agricultural colleges, universities, golf courses, parks, and homeowners. These tests range from carefully planned experiments, replicated many times, to demonstration-type tests. All kinds of grasses, such as bluegrasses, bentgrasses, fescues, ryegrasses, St. Augustine grass, and other ground covers such as dichondra have been treated with Panogen Turf Fungicide successfully. Diseases such as melting out, fading out, dollar spot, copper spot, brown patch, and snow mold are all controlled by the proper application of this fungicide.

In order for PTF to effectively

(*Continued on page W-17*)



Customer satisfaction—permanent patronage—requires sure, consistent results: the kind you can guarantee when you use TRITHION insecticide for lawn chinch bug control.

Chinch bugs are small sucking insects that feed on the juice in leaves and stems of grass, causing brown patches and eventual death of infested lawns. Chinch bug destruction is a growing problem around the country . . . but one you can solve with TRITHION.

Since 1960, thousands of lawns have been treated with TRITHION. Results have been outstanding!

TRITHION *gives quick, positive control.* It's a fast-acting compound that controls *all* chinch bugs, even those resistant to other materials.

TRITHION *is easy to handle safely.* It is less hazardous to handle than many other organic phosphate pesticides. TRITHION is an easy-to-apply emulsifiable liquid . . . and also is available in granular form.

TRITHION *offers one-shot control . . . that lasts.* Repeat applications are rarely needed with TRITHION—"one-shot control" *stops* chinch bugs. Its long residual action means long-term protection . . . with resulting reduced costs.

Use TRITHION on *your* customers' lawns. You'll boost and *maintain* the demand for *your* service. For details, write Stauffer Chemical Company, Agricultural Chemicals Division, 380 Madison Ave., New York 17, N. Y. ®Stauffer's Reg. T.M. for an insecticide-acaricide

Stauffer
CHEMICALS

Ecology Is Keynote to Successful Waterweed Control, Delegates to 3rd Aquatic Weed Society Meeting Told

"Know the ecology of weeds and how to use plants to best advantage."

This was the tone set by keynoters at the Third Annual Aquatic Weed Control Society Meeting, February 12 and 13 at Chicago's LaSalle Hotel.

Dr. Daniel L. Leedy, Chief of Wildlife Research for the U.S. Fish and Wildlife Service in Washington, D.C., explained that sometimes complete removal of weeds from an area can do as much damage as when the area was choked with vegetation. He enlightened the 85 delegates about the two faces of weeds, citing examples such as the detrimental ragweed, cursed by hay fever sufferers, but a boon to bobwhites and hunters.

In the field of aquatics, Dr. Leedy related how cattails can make an area unusable for wildlife and man, too. But by really controlling, that is, manipulating the cattail environment, operators can make the most use of these areas by providing harborage for ducks, and give a chance for beneficial plants to grow. At the same time, the area is made more attractive for recreation and sports.

"In areas such as the Chesapeake Bay where water milfoil kills young oysters and hampers harvesting operations, a different degree of control is necessary. This must be a part of the applicator's decision on what to use and where to use it," he continued.

"Complete control is impractical and unwise," the wildlife expert went on, "since aquatic plants oxygenate water, stabilize soils, reduce erosion, regulate water flow, provide spawning areas for pickerel, and provide homesites for fish food insects. If you eliminate all weed plants, you do have a problem," he maintained.

New tests with arsenicals for aquatic weed control were discussed by Leslie Reed (left) of Chipman Chemical Co. Here he talks with Robert E. Lucas of Ansul Chemical Co.

"Fenac, a terrestrial herbicide, is finding an application in aquatic weed control through combinations with phenoxy compounds such as 2,4-D and silvex," according to Amchem's Dr. John Gallagher, researcher for that company in Ambler, Pa., and member of the society's panel discussing industry progress on new herbicides.

"When used against alligatorweed, Fenac reduces the amount of phenoxy material needed for control. And when combined with Amitrol-T against water hyacinth, knockdown rate is increased," Dr. Gallagher continued.

First evidence of Fenac's effectiveness was provided by a USDA group from Denver working with pre-emergent herbicides on drained irrigation canals. At 20 pounds per acre of Fenac sodium salt applied to a canal bottom, 93 to 99% control of sago pondweed was achieved the next season.

For control in larger bodies of water, best results were obtained in embayments which are protected from running water. With a concentration of 1 ppm, Fenac controlled *Potamogeton pectinatus* in trials conducted in Canada, the Amchem field expert related.

"Most consistent results," Gallagher continued, "have been with pre-emergent treatment of unfrozen pond and lake bottoms during drawdown (lowering the water level). There is a definite period of time during which the chemical must contact the soil for best results. Tests along running streams have not been favorable due to greater water change, which prohibits sufficient contact time."

According to most recent findings, Fenac will be tested as a pre-emergent on pond and lake bottoms, as a total application to small ponds at 1 to 3 ppm, and as application to small lakes or ponds over ice at 10, 15, and 20 pounds per acre.

"More testing is required until we have established all the limitations and capabilities of Fenac," Dr. Gallagher concluded.

Ortho Division of California Chemical Corp. was represented by Dr. R. H. Cummings, Des Moines, Iowa, who related current studies with Diquat, Ortho's commercial product, and Paraquat, second of the quaternary dipyridyl compounds, which is not yet registered for commercial use.

"These systemic compounds require light for phytocidal action," Dr. Cummings explained. "One interesting characteristic which can be used to economic advantage

Diquat was discussed by two Ortho representatives, Dr. R. H. Cummings (left) and Ben Quisenberry. Ortho manufactures Diquat.

is that application rates can be cut one-third, if Diquat is applied within one hour of darkness. Darkness gives the absorbed herbicide a chance to be freely translocated by the plant. Daylight then brings a rapid death. This cut rate in twilight gives the same results as the daytime application rate," he claimed.

While herbicidal action was formerly thought to be due to the salt, later work has shown that the cation (positive portion of the molecule) is the active ingredient. "Both previous formulations of Diquat of 4 lbs. per gallon and 2.8 lbs. per gallon of the salt contain 2 pounds per gallon of the cation. Dosage rates are now calculated on the basis of the cation content," Cummings elaborated.

"Because of this discovery, we now advise that anionic wetting agents such as alkyl sulfonates not be used, and that nonionic and cationic wetting agents may be used," he cautioned.

Diquat is presently registered for several aquatic species and tests are being conducted with both Paraquat and Diquat to de-

termine effectiveness against many others.

Foliage absorption is fast for both compounds, but contact with soil quickly inactivates them. For this reason, caution is advised when using Diquat in muddy water, which will also deactivate the herbicide, Cummings reported. Additional work is being done to determine if dosages will differ with types of soil, and if so, by how much, he continued.

Diquat is considered safe to fish and micro-organisms when used at correct dosages. Toxic levels of Diquat are 4 to 20 times the weed control level, the Ortho researcher stated. Studies are continuing and "are certain to give rise to important biological findings and produce many new commercial uses for these compounds," Dr. Cummings concluded.

Aqualin Works for 8 Weeks

Donald Lewis spoke for Shell Chemical Corporation's Aqualin, explaining that the active ingredient, 85% acrolien, is a general cell toxicant and has controlled weeds for 8 weeks when applied to running water.

Under a different label and concentration, Aqualin is used to control black algae in swimming pools

Both U.S. and Canadian government agencies were represented. Here are keynoters Dr. Daniel Leedy (left), USF&WLS and Canadian Dr. E. G. Anderson, who explained aquatic weed legislation.

in Southern California. Around paper mills and other plants which produce slimy wastes, Aqualin is formulated as a "slimicide" to reduce this unsightly occurrence.

"Biocide" is the name of Shell's Aqualin formulation which controls odor producing bacteria in water. Lewis also stated that International Shell has used an Aqualin formulation to control shistosome-infected snails in Africa. CAs should check registration of all products before attempting to use one for an untested or unregistered purpose, Lewis cautioned, in light of Aqualin's various end uses.

Pennsalt Chemicals Corp. was represented by Harold Lindaberry, Aurora, Ill., who spoke on the recent addition of Aquathol Plus to the Aquathol line.

Aquathol is a combination of dipotassium endothal and potassium silvex, 5% of each, so that active ingredients total 10%. "Its purpose is to broaden the spectrum of weeds controlled," Lindaberry explained. "Since some weeds are susceptible and others not, we hope to control both with this chemical."

As an example, he cited the case of milfoil and *Elodea* growing together or near each other. *Elodea* is resistant to endothal but can be killed with silvex, and milfoil is resistant to silvex but is susceptible to endothal, so both can be controlled with Aquathol Plus, according to Lindaberry.

Samples were distributed last year, Lindaberry said, in order to find the strong and weak points of formulation in on-the-job performance.

"Although we have had no trouble with mud, turbidity, or pH interfering with our tests, wave action causes difficulty when treating narrow margins. The turbulence causes excess dilution through diffusion," he explained.

"Aquathol is intended to give better control over a larger variety of mixed weed populations," Lindaberry summarized.

Casoron Examined

Casoron, a new compound produced by Philips in Holland and being developed in the United States by Thompson-Hayward Chemical Co. was explained by Dr. C. Allan Shadbolt, director of field research for the Kansas City firm.

Casoron was formerly known as Niagara 5996 and has the accepted common name of dichlobinil. It was originally developed as a preemergent herbicide, and only in the last year was its potential as an aquatic herbicide recognized, according to Dr. Shadbolt.

"The 4% granular form performs a little better than the more volatile wettable powder form for aquatic work," he stated.

Effective action of the herbicide against sago pondweed is presently down to 1 ppm, and 5 to 20 pounds per acre has controlled both American and sago pondweed for 4 to 5 months, Dr. Shadbolt claimed.

Spring applications of 5 to 20 pounds per acre will be preferred to fall applications. Best results in trials so far have shown that

Operator meets supplier. Wayne Smith (left) and David Shand (center) of Marine Research of Ontario quizzed Pennsalt's Fred Tempy.

dry beds of streams of narrow margins affected by a drawdown when treated with Casoron give best results. Soil incorporation improves control. An extended exposure time is necessary, so treatment is usually limited to nonrunning water.

Applicators Show Self-Made Equipment

The two-day meet was concluded with an applicator forum on equipment.

Shown by slides and film were boats, barges, and application systems devised and developed by applicators themselves.

Harry Walker, Harry Walker and Sons, Plainfield, Wis., explained the barge which he uses in aquatic weed work. It consists of a flat-bottomed steel barge 28 feet long by 8 feet wide. It has retractable wheels and is pulled on the highways by an International Scout with 4-wheel drive. It is equipped with electric brakes, stop, turn, and clearance lights. Propelled by a 40 hp. outboard, the barge can do 12 mph with a load of three tons, drawing 20 inches of water.

A full load, Walker explained,

Familiar face at weed meetings is that of Dr. Robert Hiltibran, aquatic weed expert from the Illinois Natural History Survey.

If applicators can't buy the equipment they need, they build it. This trio of operators, each of whom has experimented with new barges and sprayers, are (l to r) Harry Walker, E. Victor Scholl, and Henry P. Carsner.

is about ten 30-gallon drums of arsenite, with necessary pumps, motors, etc. A crew is three to four men.

A Gorman-Rupp Dual Fire Fighter is the pump apparatus used. It delivers 80 gallons per minute at 80 lbs. of pressure. Empty drums are generally kept on the barge and pumps transfer arsenite from the loading truck into the barge drums. Each 30-gallon transfer takes about three minutes.

For copper spraying, Walker uses two 55-gallon, plastic-lined steel drums. A small pump fills the drums with water so operators can premix the copper solution. Each 55-gallon drum takes about 30 lbs. of copper. While one is being sprayed, the other is being filled.

A brass fire hose nozzle, ¼ or ½ inch, can shoot a stream of chemical 50 to 75 feet, if required.

Walker stressed the necessity for each man to know his job before beginning operations, because the noise on the barge limits conversation.

All men must be aware of the danger involved in handling the compounds which they use, and he cautioned the industry that "accidents and errors, caused by any of us, reflect on all of us."

Use Airboats Cautiously

Henry P. Carsner, Northwest Weed Service, Tacoma, Washington, showed the society how his firm makes use of shallow draft, airplane propeller-powered boats. Since many times, weeds develop in what Carsner called "formidable waters," the airboat now makes treatment of these areas possible. Where drawdowns are necessary, an airboat will ride over wet mud very smoothly.

Payload of Carsner's airboat runs around 5,000 pounds and with improved designs of hull and controls, "a highly maneuverable and stable craft results."

Carsner added a warning thought to anyone wanting to develop an airboat: "Any propeller is a dangerous piece of equipment. It is capable of decapitating a person or effortlessly removing an appendage carelessly misplaced. The propeller must be *fully* enclosed in a suitable propeller guard." Carsner spoke as an authority, having had his left hand removed in a propeller accident.

Carsner told *Weeds and Turf* that he has seen cases where helpful bystanders could have been hurt by unprotected propellers because they want to help the operators push the boat away from or to the dock, and they cannot see the propeller because it moves so fast. "They could fall right into it," he stressed. He also suggested the use of electric starters so that the operator does not have to be near the moving propeller.

Proceedings of the Aquatic Weed Society Meeting were available to delegates on arrival. Here registration chairman Harold Lindaberry of Pennsalt (left) shows a copy to Dr. Duncan McLarty, University of Western Ontario, London.

A talk on closed injection systems was presented by E. Victor Scholl, Modern Weed Control, Grand Rapids, Mich.

A closed system places the chemical into the water through a tube or tubes under the surface.

Scholl has taken a 1-inch steel pipe and brazed half-hose couplings into it, each about a foot apart; the total length of the pipe is around 20 feet. There is a universal joint on each side of the square barge's bow which permits the steel pipe to be retracted along side, just under the rubrail.

Two-foot lengths of rubber hose, fitted with the other half of the hose couplings, are screwed onto the brazed couplings. Then as the barge progresses through the water, the chemical, usually Aqualin, according to Scholl, is injected under the surface.

Another innovation on his barge is a 16-foot extendable pipe for reaching under docks and floats. This long "wand" is mounted on rubber rollers across the bow, so the operator can easily extend it, left or right. A hose also hangs downward from the end of the pipe. In order to keep the hose straight down into the water, a 1-inch lead pipe weight is fitted to the end.

Elect New Helmsmen

Officers for 1963 elected at the meeting, presided over by 1962 president Paul Eller, Chipman Chemical Co., Chicago, were: Henry P. Carsner, president; Charles L. Bolster, 1st vice president, Pennsalt Chemical Co., Philadelphia, Pa.; Kenneth Mackenthun, 2nd vice president, Robert A. Taft Environmental Health Center, Cincinnati, Ohio,; Edward Bacon, secretary-treasurer, Michigan Conservation Department, Jackson.

The 1963 Board of Directors consists of Paul Eller and Robert Huckins, Chipman Chemical Co., Chicago; William Fox, Chipman Chemical Co., Hamilton, Ontario, Canada; Roy Younger, Consulting Biologists, Inc., Spring House, Pa.; and David Shand, Marine Research of Ontario, Peterborough, Ontario.

Success brings smiles, and these 1963 officers of the Aquatic Weed Society are obviously happy about this year's meeting. Elected were: (front row, l to r) Charles P. Bolster, first vice president; Henry P. Carsner, president; and Kenneth Mackenthun, second vp. Standing are (l to r) Paul W. Eller, director; Edward Bacon, secretary-treasurer; and Robert Huckins and William Fox, both directors. Absent directors are David Shand, Roy Younger.

Panogen Turf Fungicide
(*from page W-12*)

control turf diseases, it is important that the active ingredient is brought in intimate contact with the grass leaf and with the soil surface. Fungi which cause diseases may be present both on the grass and on the soil surface. To accomplish most effective distribution, Panogen Turf Fungicide has to be diluted with a suitable amount of water. Recommended rates of application range from 1½ to 3 fl. ounces per 1,000 square feet of turf area. For best distribution, it is suggested that these quantities be diluted with 10 gallons of water per 1,000 square feet.

Equipment needed for application ranges from sprinkling can to power sprayer, depending on the size of the area treated. Excellent results and ease of application are all accomplished by using devices such as Hozon applicators or other proportioning equipment.

When to Treat

Panogen Turf Fungicide can be used either for prevention of turf diseases or for control of the spread of already established diseases. Preventive treatment is advisable since disease which has already occurred may have thinned out or damaged the turf to such an extent that it will take some time for new grass to fill in.

Several applications are necessary for all diseases, since new fungus is carried in by air currents, with rain, and from traffic over the grass areas. For dollar spot, copper spot, and brown patch, 1½ fl. ounces should be applied at approximately 7-day intervals. For melting out and fading out, 3 fl. ounces should be applied at 10-14-day intervals. Applications should be started as soon as the grass greens up in the spring.

To prevent snow mold, use 3 fl. oz. of the chemical in 10 gallons of water, and spray, particularly in areas where snows may accumulate or where snow mold is known to appear. This treatment should be repeated at least once during midwinter thaws.

It is best to treat with PTF in the morning or in the evening when temperatures are moderate.

For more information on turf diseases, refer to the Nov. '62 issue of Weeds and Turf, *page W-1, "How to Control Turf Diseases." Ed.*

For best results the lawn should be mowed the day before treatment and clippings removed.

Establishing New Lawns

A use of Panogen Turf Fungicide which may prove exceedingly valuable is in establishing new turf areas. Much of the sprouting grass seed may succumb to seed rot or damping-off diseases, especially if weather conditions are adverse. Fungi causing damping-off are ever present in the soil. Applying PTF at time of seeding will serve as an insurance that the grass seed will not be attacked by harmful fungi and that an even, healthy stand of grass will result. For new turf areas, apply the fungicide diluted at a ratio of 3 fl. oz. per 10 gal. of water per 1,000 square feet to the area prepared for seeding. Plant grass seeds over treated soil in usual manner and water thoroughly.

34th International Turf-Grass Show Draws 1300; Delegates Study Soil Fumigation, Turf Diseases

Who appreciates fine turf more than the men and women who play on America's lush golf greens?

Probably the golf course superintendent, whose job consists largely of maintaining these healthy stands of grass. And nowhere was this concern more apparent than at the 34th International Turf-Grass Conference and Show, February 11-14, in San Diego, Calif.

Nearly 1300 delegates gathered at the El Cortez Hotel's convention center for the annual affair, which is sponsored by the Golf Course Superintendents Association of America.

While attendance is primarily confined to golf superintendents, the meeting features yearly a regular series of educational lectures and seminars devoted to study of turf diseases, insects, fertilizers, and maintenance equipment. For this reason, much of this year's program contained information useful to contract applicators, particularly those who treat golf courses, or act as advisers or consultants.

Also of interest to CAs is the annual trade exhibition, which shows off the latest in chemicals and equipment for turf care. In San Diego this year, delegates were treated to a lavish display of new spray rigs, aerifiers, verticutters, chemicals, and related materials.

This is the largest turfgrass show in the world, according to Dr. Gene C. Nutter, GCSAA Executive Director.

A practical discussion of contract soil fumigation on golf greens was one conference highlight significant for golf men and contract applicators alike.

Explanation of this relatively new technique (*W & T*, Feb., p. W-8) came from Donald E. Leaman, Technical Director, Agricultural Chemical Sales, Neil A. Maclean Co., El Monte, Calif.

Leamen described the soil fumigant methyl bromide as "a tremendous herbicide which permeates very fast."

It is important that soil be properly tilled and moist before fumigant is applied, Leamen reminded his audience, or some seeds will not germinate and thus be killed. While most weeds are vulnerable to MB, the Californian continued, the chemical will not kill seeds of either cheeseweed or clover.

Chloropicrin Good Fungicide

Many chemical preparations now used for soil fumigation contain chloropicrin, a good fungicide, Leaman said. In combination with MB, which kills the weeds, chances for healthy turf are greatly enhanced.

Large equipment that automatically lays tarps, under which soil is fumigated, and especially designed injectors, have been developed for soil fumigation jobs, Leaman went on. Drawback here is that on some courses, heavy machinery may cause compaction of the soil, which reduces the opportunity for vigorous grass growth.

"Top Turf Tip" Panel

A unique feature at the 34th Turf-Grass Conference was a panel of university experts from western states which offered turfmen their latest research findings.

Featured on the panel were Dr. Leland Burkhart, Director of Horticulture, University of Arizona, Tucson; Dr. Norman R. Goetz, Extension Weed Specialist, Oregon State College, Corvallis; and Dr. Charles J. Gould, Plant Pathologist, Washington State University, Puyallup.

In the Pacific Northwest, Dr. Goetz said, prolonged winter rains and mild temperatures create turf disease epidemics. Proper winter treatment is necessary, particularly in turf planted in areas of high altitude, and especially that planted to fescues and ryegrass.

Another big problem is thatch control. "After all, in the Pacific Northwest, we raise the best thatch in the U.S.," the Corvallis scientist joked. Reason for this, apparently, is that low soil temperatures make thatch hard to decompose.

Four Big Diseases in the West

Dr. Goetz was followed by Dr. Charles J. Gould of the Western Washington Experiment Station in Puyallup.

"In the Pacific Northwest," the plant pathologist began, "our four major turf diseases are *Fusarium Patch, Corticum Red Thread, Typhula Snow Mold,* and *Fairy Ring.*"

Nationwide, the diseases of most concern are *Brown Patch, Dollar Spot, Helminthosporium Blights,* and *Fairy Ring.* (See *W&T*, Nov. 1963, p. W-1).

While cultural controls are naturally obligatory, Dr. Gould believes it is still necessary to depend largely on a fungicide for disease control.

But the best fungicide, applied improperly, is of no use. For this reason, the scientist continued, watch carefully how applications are made. For example, (1) use a suitable measuring cup (not a metal one which is so beat up it no longer holds the amount it once did, and certainly not a soft drink bottle); (2) use a meter for proper calibration of spray equipment; (3) mow before ap-

Intent on improving turf care techniques, delegates to the 34th International Turf-Grass Show listened to introductory speeches by Dr. Gene C. Nutter, GCSAA Executive Director (at podium) while association president, Sherwood Moore (seated, right) and San Diego Mayor Charles C. Dail, (seated, left) waited to address the 1300 delegates.

TURF:

One application of dieldrin controls major turf pests for an entire season

Dieldrin controls soil insects such as Japanese beetle grubs, white grubs, sod webworms and ants. These insects feed on grass roots, cut off nourishment and moisture and cause browning and bare spots.

Dieldrin also controls annoying, health endangering surface pests such as ticks, fleas and chiggers. Here are the details.

Now is the time to size up your turf insects problem and do something about it.

If you cannot start healthy, vigorous grass growing in certain areas, or if you have bare patches, soil insects could be the cause.

Turn up some sod in these trouble spots and sift through the dirt. See if you don't find grubs or some other evidence of soil insects.

Long-lasting dieldrin protection

If these soil insects are your problem, you can control them with dieldrin.

A single application lasts for a year or more. It protects roots—lets them utilize maximum nourishment and moisture.

Dieldrin can be applied in a number of ways. It can be sprayed on as a liquid or applied in granular form with a fertilizer spreader. Dieldrin is also available in fertilizer mixtures. This lets you combine the two operations and saves time and money.

Controls ticks, fleas and chiggers, too

Dieldrin also controls ticks, fleas and chiggers. These pests are not only annoying, but also are public health problems.

In addition to applying dieldrin to turf, to get maximum control of these above-ground pests, treat weeds, the ground around low-growing shrubs and buildings—anywhere these pests might take refuge.

Where to get dieldrin

Dieldrin is available from your local insecticide dealer under many well-known brand names. Accept no substitute. Check the label or the ingredient statement on the formulation you buy for the name *dieldrin*.

Shell Chemical Company, Agricultural Chemicals Division, 110 West 51st Street, New York 20, New York.

Control all these turf pests with dieldrin

European chafer grubs	Cutworms
Green June beetle grubs	Sod webworm
White grubs	Armyworms
Northern masked chafer grubs	Sowbugs
	Pillbugs
Asiatic garden beetle grubs	Snails
Oriental beetle grubs	Wireworms
Japanese beetle grubs	Root maggots
Earwigs	Slugs
Ants	Chiggers
Striped grassworm	Fleas
Mole crickets	Ticks

SHELL

dieldrin

A PRODUCT OF SHELL CHEMICAL COMPANY

plying a fungicide so maximum penetration results; and (4) watch out for proper coverage, because a distracted sprayman may miss a section.

Impurities from dirty water will inactivate many mercurial compounds, Dr. Gould warned, so use clean (but not necessarily distilled) water for dilutions.

Another problem is rusted equipment, also of particular harm to mercury compounds.

Dr. Gould concluded that these guides, followed closely, would not be effective unless the individual in charge of a turf area is familiar with the regional differences and peculiarities which affect local grasses.

In Dr. Burkhart's discussion, particular attention was focused on types of trees for golf course ornamentation.

More attention to the Northwest came from another Washington State University expert, Dr. Roy L. Goss, Assistant Agronomist and Extension Turf Specialist at the Western Washington Experiment Station in Puyallup.

There is a great variety of soil type and climate in Dr. Goss's region, and this is one of the reasons why he insists on the importance of a soil test.

Many devices are available for conducting such tests.

Dr. Goss said compaction and drainage problems are partially responsible for the loss of bentgrasses and invasion by *Poa annua*.

But at least, he continued, dandelion and plantain are not much trouble since the advent of 2, 4-D.

Five kinds of fertilizers, which through various devices give off nitrogen for longer periods than ordinary growth stimulants, were reviewed by Dr. O. R. Lunt, Associate Professor of Agronomy, University of California at Los Angeles.

These slow-release fertilizers are one of the following types: (1) coated; (2) low solubility; (3) organic; (4) synthetic organic; and (5) ion exchange.

Dr. Lunt said the last method, which he called a somewhat obscure chemical process, is only of "academic interest."

Success has been achieved, the scientist went on, with soluble fertilizers which have been coated with a membrane. When such a coated fertilizer is placed in moist soil the nutrients diffuse out at a very steady rate for two or three months, depending on the soil compaction.

Materials with limited solubility, such as metal ammonium or potassium phosphates, are capable of supplying nitrogen, potassium, or several micronutrients to the soil at slow rates.

"But the high phosporus-nitrogen ratio of metal ammonium and potassium phosphates makes these materials best adapted to single or occasional use," Dr. Lunt warned.

Trade Show Adds to Conference

Educational programs at the International Turf-Grass Conferences are run for half-days only, to give delegates a chance to explore the extensive trade show area, where suppliers are on hand all day to give out samples, demonstrate equipment, or talk about current turfgrass problems.

While some equipment on display, such as golf carts and green markers, are of little practical interest to custom sprayers, the major portion of the exhibits are concerned with care of turf.

Manufacturers of such chemicals as insecticides, fungicides, weed-killers, and fertilizers were on hand, as were the companies which make sprayers and dusters to apply the compounds.

GCSAA Elects Nelson

Included in the conference also is the annual business meeting of the Golf Course Superintendents Association of America, which this year elected Roy W. Nelson as 1963 president.

Nelson is from the Ravisloe Country Club in Homewood, Ill.

Philadelphia was chosen as 1963 meeting place, Dr. Nutter told *Weeds and Turf*. Convention site is the Sheraton Hotel, and dates are Feb. 9-14.

Contract applicators who want to attend the meeting to hear the educational discussions and view the suppliers' exhibits are welcome, Dr. Nutter said. All delegates are expected to pay the usual registration fee, the GCSAA Executive Director informed *W & T*.

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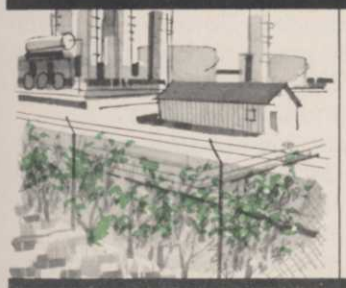

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"Charter members" of the Illinois Custom Spray Operators' Training School looked on while University of Illinois agronomist and featured speaker Dr. F. W. Slife (seated on right) talked with "first year man" Ray Fuxa (left), Miller Chemical Co. "Old Timers," Lillard Hedden, Pekin aerial spray applicator; farm adviser A. C. Kamm, Monticello; and Weldon Wadleigh, Stauffer Chemical Co., have attended all the Schools since they started 15 years ago.

Turf and Aquatic Weed Control Surveyed at 15th Ill. Spray School

Contract applicators were among the more than 500 delegates to the 2-day, fact-filled 15th Annual Illinois Custom Spray Operators' Training School, held at the University of Illinois, Urbana, Jan. 23-24.

Although directed primarily at spraymen in agriculture, the school also turned its attention to activities in the fast-growing turf maintenance field, and touched on developments in aquatic weed control.

Dr. F. W. Slife, from the University's Department of Agronomy, led into the sessions on weed control in the urban/industrial market with a review of herbicides, emphasizing pre-emergents.

"Pre-emergent chemicals have proven their worth," Dr. Slife began. "Although there will undoubtedly be new chemicals introduced, CAs should concentrate now on making the best possible use of the formulations available."

The importance of knowing soil characteristics before beginning application was stressed. "Each pre-emergent herbicide moves differently in various soils, and this could influence results considerably," he reminded CAs.

Another important consideration is the length of time a herbicide will remain in the soil, Dr. Slife continued.

Amiben, 2,4-D, dalapon, and Eptam disappear rapidly, Dr. Slife pointed out. "When used at recommended rates, these compounds do not normally persist for more than a month or six weeks," Dr. Slife revealed. Others, like monuron, atrazine, and simazine, may persist in toxic quantities until the next growing season.

Sod Webworm Damage Reviewed

"Although there are some 60 species of sod webworms in the U.S., less than one-third are economic," Steve Moore, associate entomologist at the Illinois Natural History Survey, told delegates. Of these, most of the damage in 1962 was caused by the larger sod webworms, *Crambus trisectus* Walker, Moore observed.

"Most obvious sign of infestation is the presence of an unusual number of birds attracted to the lawn to feed on the webworms," Moore pointed out. "But by the time birds invade lawns, there may be brown areas because of extensive webworm feeding, necessitating control measures."

"A well-kept lawn, fertilized and watered, may support a considerable population of webworms without serious damage," Moore revealed. On the other hand, a shortly mowed, dry lawn may be quickly injured.

Careful inspection is required to detect the larvae, but some of the larvae can be flushed out if water from a garden hose is allowed to run on an infested spot of lawn.

According to Moore, DDT and dieldrin were among the most reliable materials used during 1962. Since it is necessary to apply the insecticide to the blades of grass, granular formulations are not recommended, and sprays take priority over dusts.

Moore concluded with the following recommendations: "DDT should be used at the rate of 2 lbs. per acre, or one gallon of the 25% emulsifiable concentrate for an acre; this equals 1 qt. per 10,000 sq. ft. Use 2½ pints of the 1.5-lb.-per-gal. dieldrin emulsion concentrate per acre, or 10 oz. for 10,000 sq. ft. Use enough water, 100 gallons per acre or more, to thoroughly wet the grass, and then do not water the lawn for three days."

"Leading pre-emergence materials for crabgrass control appear to be Dacthal and Zytron," Dr. Slife told the spraymen in his second speech. Dacthal is recommended at 10 lbs. per acre, and Zytron at 15 lbs. per acre.

"Applications should be made about 2 weeks before expected crabgrass germination," Dr. Slife recommended. Both Dacthal and Zytron appear to lose their residue by fall, permitting fall seeding of turfgrass, if necessary.

During his discussion of new chemicals for pre-emergent crabgrass control, Dr. Slife noted that although trifluralin has given excellent control, low turf tolerance may bring homeowner complaints.

Calcium propyl arsonate works best when applications are made just before crabgrass germinates, Dr. Slife remarked. Control lasts only six to eight weeks, and seedling turfgrass has good tolerance to it.

Results have been variable, but generally good, with Diphenatrile, according to Dr. Slife. "Turf has good tolerance to it, and like most other pre-emergence crabgrass control chemicals, it works best when applied along with a good fertility program," Dr. Slife conceded.

Dr. Slife concluded the conference with the warning that every sprayman must be on the lookout for any mistakes, since the threat of more and more restrictive legislation on the use of pesticides is very real.

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Know Your Species

BUCKHORN PLANTAIN
(Plantago lanceolata)

BROADLEAF PLANTAIN
(Plantago major)

Plantains are perennials, reproducing mainly by seed, but also by new shoots from the fibrous roots of some species. They are found on rich soils of lawns and meadows, although they will tolerate drier conditions of roadsides and waste areas. Except for Rugel plantain, which is native to North America, these weeds were introduced from Asia and are now widespread throughout North America. They are uniquely characterized by a basal rosette of longitudinally veined leaves and erect leafless stems bearing many tiny green flowers.

Broadleaf plantain, *Plantago major*, has a long slender spike atop the stem. Leaves are slightly hairy, almost oval, and are borne on long petioles (leaf stalks). Both leaves and stalks are dull green in color. Each tiny flower will bear 6 to 20 seeds, which are about 1/16 inch long, variable in shape, angular on one side, and with ridges radiating from a central scar. Seeds are shed from a capsule which opens by a lid.

Buckhorn plantain, *P. lanceolata*, also has a long stem but it terminates in a short, almost cylindrical spike of flowers. Leaves are elongate and slender (lanceolate) and only slightly hairy. Flower parts have dry margins which give the spike a light brown appearance. The filaments which bear the stamens (male portion containing pollen) are very long and can be seen persisting on the spike. Each flower capsule bears two glossy brown, boat-shaped seeds, about 1/16 inch long.

A third species, Rugel plantain, *P. rugelli*, is similar to broadleaf plantain except that Rugel is less hairy, more stout, with wavy indentations on the shiny green leaves, and has a purplish petiole.

2,4-D applied in spring or fall will eliminate any of the plantains. Repeated spot treatments may be necessary. Dichondra, St. Augustine grass, and clover may be injured by this treatment.

Prepared in cooperation with Crops Research Division, Agricultural Research Service, United States Department of Agriculture, Beltsville, Maryland.

(DRAWINGS FROM NORTH CENTRAL REGIONAL PUBLICATION NO. 36, USDA EXTENSION SERVICE)

Japanese Beetle Shows Changes

Japanese beetles in Connecticut are moving from good turf to rough turf, entomologist Raimon L. Beard reports. "There has been a sharp decline in the number of Japanese beetles in lawns and gardens, but more and more grubs are found in rough turf," Beard writes in the January issue of "Frontiers of Plant Science," publication of the Connecticut Agricultural Experiment Station.

Greater grub survival in rough grass areas probably results from natural selection, Beard suggests, whereby only individuals able to adapt to new surroundings survive to reproduce. "Japanese beetles have an amazing ability to adapt to changing environment," Beard notes.

Copies of "Frontiers of Plant Science," which include Beard's article, are available by writing Publications, Box 1106, New Haven 4, Conn.

Ortho Expands Research Units

New research facilities, including a biological laboratory, are being constructed at Tank Farm Hill, Richmond, Calif., for Ortho Division, California Chemical Co.

Planned complex of buildings is part of an expansion program begun during 1962 by Ortho Research & Development, and will supplement the central research facilities at Richmond headquarters, the firm reveals.

Ortho's new biological research lab will be 50′ by 150′, with two wings, one devoted to plant science and the other to entomology. To the rear of the main lab will be a 1,000 sq. ft. spray and incubator building and a 20′ by 40′ greenhouse, one of 6 greenhouses scheduled for completion at a later date.

Weed Society Sets 1964 Meet

Fifth Annual Conference of the Weed Society of America will be held at the Pick-Congress Hotel, Chicago, Ill., February 10-13, 1964, the public relations committee of that organization has confirmed.

More than 1,000 applicators, researchers, and education workers, representing colleges, chemical companies, weed control firms, public health and regulatory agencies, and others are expected to attend.

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Trimmings

No quips about this equipment! Anyone who knows J. Edwin Sameth of Western Soil Management in Newark, N.J., will also know what pride this firm takes in its fleet of gleaming, completely outfitted spray trucks. But, Ed writes us, sometimes it takes an unusual event to point this out. Not too long ago, while one of Ed's servicemen was engaged in treating a large refinery in Philadelphia, some pranksters sneaked up on the parked truck and put sugar in the gas tank, which put the spray rig temporarily out of commission. Undaunted, the company quickly rented a truck, mounted some portable sprayers, and completed the job. Unfortunately, a local supplier saw the rented vehicle and made some disparaging remarks about Western's trucks. And, as such things go, the comments filtered back to Western executives, who lost no time in tracing down the individual who had judged Western on this one piece of rented equipment. There followed an exchange of correspondence, in which, Ed tells us, the true picture of Western was pointed out to the supplier. "After all," Ed writes, "any one piece of our equipment represents an outlay of $10,000 plus; and you can be sure we do our utmost to show these machines off to best advantage!" We hope (and believe) that this commendable pride in one's appearance and reputation is typical of contract applicators, and congratulate Ed on taking the time to right a wrong impression.

* * *

Westward Ho! **Back in February, when the grip of winter still strangled the Midwest, we wrote about our talk with U.S. Borax's D. W. Rake of Anaheim, Calif., and envied him his sunny clime. We also said we'd gladly journey west if the Boss gave us his "bon voyage." Shades of Horace Greeley, but we found ourselves, in the heart of bitterly cold February, attending the 34th International Turf-Grass Conference and Show in San Diego! It was a welcome chance to meet and talk with turf people from all over the country, and who's going to deny that even a meeting of the Peanut Brittle Manufacturers of America would have given enough cause to forsake the slush and icy winds of the winter of '63!**

* * *

Genial Gene. Speaking of the Turf-Grass Conference, we also want to commend genial Gene Nutter, Executive Director of the Golf Course Superintendents Association of America, which sponsors the event, called "the greatest show on turf." Dr. Nutter and his staff, we're pleased to say, gave *Weeds and Turf* representatives a most gracious welcome, and enabled us to report in detail on the educational aspects of the event. (See page W-18). Dr. Nutter, who's headquartered in Jacksonville Beach, Fla., had a smiling visage for all.

* * *

Londonerry heirs? **It's good to know that our own state of Ohio is contributing to the improvement of turf technology. We have just learned, in a bulletin from the Florida Turf-Grass Association, that Dr. Everet Burt, who was born in Londonderry, Ohio, is the new Turf Technologist at the USDA Plantation Experimental Lab. Dr. Burt got his Ph. D. from Ohio State in 1954, was associated with the University of Florida, then with O.M. Scott, before taking the Plantation Lab position. To a fellow Buckeye, we send hearty congratulations.**

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